DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date January 8, 1992

From Chief, TSS, ERCB, DHAC, ATSDR (E32)
Environmental Health Scientist, TSS, ERCB, DHAC, ATSDR (E32)

Subject Health Consultation: Bayonne Barrel And Drum Site (A089)
Essex County, Newark, New Jersey

To Arthur Block
Public Health Advisor
ATSDR Regional Services
U.S. EPA Region II
Through: Director, DHAC, ATSDR (E32)
Chief, ERCB, DHAC (E32)

BACKGROUND AND STATEMENT OF ISSUES

The Agency for Toxic Substances and Disease Registry (ATSDR) was requested by the Environmental Protection Agency (EPA) in Region II to comment on the public health implications posed by contaminants present at the Bayonne Barrel and Drum site. This site was the subject of a health consultation written by ATSDR on February 6, 1987 [1]. The site is now inactive, but at the time of that report, the facility still had limited usage as a truck repair and shipping container storage area.

Bayonne Barrel and Drum is a former drum reconditioning facility that incinerated contents of drums that arrived at the plant. It is located between the Pulaski Skyway and the New Jersey Turnpike in a heavily industrialized area of Newark, New Jersey. A theater is located approximately 1/4 of a mile southwest of the site, and the nearest residential area is approximately 1/2 a mile to the west [2]. The site is fenced, but the fence contains breaches and is low enough in some places to allow easy access onto the property. The future use of the site has not yet been determined [2].

There are several abandoned buildings on site, one of which contains an ash pile that was generated from incineration activities that occurred at the facility. In the same building, approximately 150 drums are present containing predominantly ash. Some of the drums contain aqueous material [3]. Several of the drums have leaked, and others are in poor condition. Ash piles are also located in the courtyard area and in the southwest corner of the property. The ash pile that is situated in the southwest corner of the property measures 50′ X 120′, and is also four feet in height [3]. The ash piles have been described as having a sludge-like consistency not prone to generating fugitive dusts [1].

301282

Several surveys were conducted from 1984 through 1988, and included sampling and analysis of soils, ash, and aqueous (drum) materials on site [3,4]. Elevated levels of volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), heavy metals, and other contaminants were detected on site.

The concentration of contaminants varied within the ash piles and also between the different piles located on the site. Two PCBs, Aroclors 1248 and 1254, were measured in the ash at a combined concentration of 408 parts per million (ppm) [3]. The ash and area immediately adjacent showed elevated levels of cadmium (1,300 ppm) and lead (8,400 ppm) [1]. The ash also exceeded the EP TOX test limit for cadmium (>1.0 mg/l) and lead (>5.0 mg/l) indicating a high leachability. Toluene diisocyanate and chromium were also detected in the ash, but at levels below health concern.

PCBs were also detected in the soils at a depth of 0-1 feet at a maximum concentration of 65 ppm. Soil contamination occurred at five to seven feet below the surface (near groundwater table) where elevated levels of petroleum hydrocarbons (59,000 ppm) and PCBs (141 ppm) were detected [5].

Aqueous samples taken from one of the drums located in the ash storage room contained benzene (92 ppm), chlorobenzene (78 ppm), ethylbenzene (1,200 ppm), toluene (2,400 ppm), tetrachloroethylene (62 ppm), and xylene (10,000 ppm) [3].

According to the EPA on-scene coordinator (OSC), on-site real-time air monitoring was conducted with an organic vapor analyzer with a flame ionization detector (FID) and with an instrument equipped with a photoionization detector. Ambient levels of VOCs were reportedly below the detection limit (approx. 1 ppm) of the instruments [2]. **Sampling locations were not identified.**

The Brunswick Shale aquifer that underlies the site has been heavily contaminated from numerous industrial sources in the area and is not used for drinking water or other purposes that would involve human ingestion, inhalation, or direct dermal contact.

DISCUSSION

Abandoned sites are typically attractions for children and vagrants. However, it is unlikely that children will access this site since the facility is situated between two major highways and 1/2 mile from the nearest residence. Therefore, populations most likely to be exposed are vagrants who may enter through breaches in the fence to occupy abandoned buildings, future workers employed for cleanup activities on-site, or for future commercial operations. For those who might enter the site, exposures to contaminated soil/ash could occur through inhalation, ingestion or through direct dermal contact. In addition to on-site exposures, future workers or those involved in cleanup activities could also inadvertently carry contamination on their clothes and shoes to their homes exposing other family members.

PCBs are a group of organochlorine chemicals that because of their toxicity characteristics in animals and in humans are often a concern at hazardous waste sites. Maximum levels of total PCBs identified during the last sampling were measured in the ash at a concentration of 408 ppm. Toxicologic data and potential exposure scenarios suggest that it is unlikely that any short-term (2 weeks or less) or intermediate duration (1 year or less) exposures by any route would result in adverse health effects. Dermal and inhalation routes to PCBs at this site are unlikely to pose any health threats.

Increased risks of adverse health effects could be calculated if chronic oral exposures to PCBs were to occur at the site. Assuming high ingestion levels of soil (100 mg) containing 408 ppm PCBs by a 70 kilogram (kg) adult worker, estimates of chronic doses (0.0006 milligram/kg/day) could be calculated to exceed by about 100 times the ATSDR's minimal risk level (MRL) of 0.000005 mg/kg/day for chronic oral exposure to PCBs [7]. The MRLs are typically based on the most sensitive indicator of observed non-cancer toxicity, usually from animal studies, since sufficient human data are not often available. The above MRL is based on signs of immunological changes in monkeys exposed by gavage to PCBs in an oil vehicle every day for more than two years [7]. The lowest dose producing the effect was 0.005 mg/kg/day [7], a dose 10 times greater than the chronic estimated dose to adults working on site. Given the circumstances of experimental exposures (oil vehicle and gavage) and the unlikelihood of an adult chronically ingesting relatively large quantities of soil (100 mg), the levels of PCBs at this site appear to pose only a minimal health threat for non-cancer endpoints. For similar reasons, cancer risks would also be minimal.

A potential health threat may exist for future workers and others who may inhale, ingest, or come in direct dermal contact with lead contaminated ash/soil on-site. The magnitude of the health threat would depend on personal habits and frequency of such activities on-site. In addition to direct exposure, on-site activities could result in contamination of clothing and shoes which could then be carried home exposing children, toddlers, and developing fetuses. Young children are at greater risk due to frequent hand-to-mouth activities and the susceptibility of their developing nervous systems to lead.

While children are normally the primary focus of health concerns associated with exposures to lead, studies of occupational exposures of adults to high levels of lead have shown impaired reaction time and memory. Lead exposure has also been linked to weakness in fingers, wrists, and ankles of adult workers [8].

The potential dose of lead that an adult worker would receive is difficult to determine. However, assuming that a worker ingested 100 mg of soil/ash containing 8,400 ppm lead, a 70 kg worker could receive a dose of lead at 0.012 mg lead/kg/day. Two laboratory studies measuring the effects of oral exposure to lead (as lead acetate) in human volunteers, found decreases in erythrocyte aminolevunic acid dehydrase (ALAD) at daily exposure levels of about 0.01 - 0.03 mg lead/kg/day [7]. The decreases in ALAD indicated that interferences with heme synthesis were occurring. In one of the studies, the decreases in ALAD reached their nadir at about 14 days and remained constant for the remainder of the 21 day study. Decreases were observed as early as 3 days after the initiation of the experiment. Blood lead levels increased from approximately 15 micrograms per deciliter (ug/dL) before the study to 40 ug/dL from ingesting 0.02 mg/kg/day [10]. Other studies have observed peripheral neuropathies (40 ug/dL) and systolic blood pressure increases (30 ug/dL) from lead exposure in the same blood level ranges found in this study [8].

The available data indicate that the lowest dose at which acute exposure (≤14 days) to cadmium demonstrated adverse health effects was for rats that consumed 2 mg/kg/day [9]. At this dose, developmental effects were observed in the young of the exposed rats [9]. At exposures of intermediate duration (15 to 364 days), impaired neurological development occurred in the young of rats ingesting cadmium at doses down to 0.04 mg/kg/day. However, insufficient data are available to assess the developmental effects of cadmium on humans at such doses [9]. The ATSDR chronic oral MRL (exposures ≥365 days) for cadmium is 0.0002 mg/kg/day. This MRL is based on an epidemiological study conducted by Nogawa et al. who observed kidney effects (tubular proteinuria) in humans exposed via food to an estimated 0.002 mg cadmium/kg/day over a lifetime [11]. The MRL was adjusted by an uncertainty factor of ten to account for sensitive individuals in the population. Assuming that an adult consumed 100 mg of ash containing 1,300 ppm cadmium, a 70 kg adult would receive a dose of 0.002 mg/kg/day. This is at the threshold where kidney effects were observed by Nogawa et al [11]. However it is very unlikely that prolonged exposures such as those studied by Nogawa would occur on this site, therefore the cadmium does not represent a health concern.

The drums contain relatively high concentrations of VOCs in the aqueous phase. Although ambient air sampling was conducted and detected no VOCs, data are incomplete on where these measurements were taken. Thus, the possibility exists that total VOC vapor levels within or near the drums could reach explosive limits. A spark or ignition source near the drums could result in an explosion or fire. Vagrants or trespassers entering the building may produce an ignition source through smoking or by the lighting of fires for warmth. Based on the small amounts of aqueous material stored on site, the potential impact of fires and/or explosions on the nearby community would be limited. Depending on how the drums are stored and stacked, they may also represent a physical hazard to those who gain access to the site.

The potential for off-site contamination via fugitive dust emissions from the ash piles and on-site containers appears to be negligible. The sludge-like consistency of the ash would prevent significant amounts of contaminated dust from migrating to nearby properties. Given the low concentrations of VOCs detected in the ash piles and in outdoor soils, and the distance to the nearest residence (1/2 mile), the threat of VOC emissions to nearby residents at concentrations of health concern also appear unlikely.

CONCLUSIONS

1. The site could pose a health threat to vagrants, future workers, or others engaged in activities on-site that come in contact with or disturb the ash. Another concern is the potential for youngsters being exposed to contaminated dust that has been carried home on the boots and clothes of workers.

2. Drums containing high levels of VOCs may pose a fire, explosion, or physical hazard.

3. Migration of site related contaminants by wind erosion or other environmental transport mechanisms to nearby businesses or residences in quantities sufficient to pose a health threat are unlikely.

4. The fence surrounding the site does not adequately restrict access to the site.

RECOMMENDATIONS

1. Restrict access to the site to prevent the entry of vagrants seeking shelter.

2. If the status of the site changes, ensure that the contaminants are at a safe level for the type of business/activities that would occur on site.

3. Consider removing barrels to eliminate safety hazards.

If any additional information becomes available or if any clarification is needed, please do not hesitate to contact this office at (404) 639-0616.

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cc: M. Lichtveld

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